

DOE F 1285.2
(08-93)

United States Government

Department of Energy

memorandum

DATE: May 25, 1999

REPLY TO: Office of Science
ATTN OF:

SUBJECT: Hazard Classification of the Relativistic Heavy Ion Collider

TO: George Malosh, Manager, Brookhaven Group

I hereby designate the entire Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory as a Low Hazard facility. As required by DOE Order 5480.25, SAFETY OF ACCELERATOR FACILITIES, the low hazard designation should serve as the design basis for the RHIC facility.

In particular, the experimental facilities are included fully with the remainder of the facility in the hazard determination.

Martha Krebs
Martha A. Krebs
Director
Office of Science

cc: John Marburger, BNL



memorandum

DATE: September 11, 1998

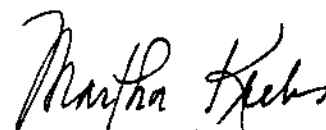
REPLY TO
ATTN OF: Energy Research

SUBJECT: Hazard Classification of the Relativistic Heavy Ion Collider

TO:
George Malosh, Manager, BHG

I hereby designate the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory as a Low Hazard facility. As required by DOE Order 5480.25, SAFETY OF ACCELERATOR FACILITIES, the low hazard designation should serve as the design basis for the RHIC facility.

Experimental facilities are not included in the hazard class determination at this time. These facilities will be included once supporting safety analysis is completed and an appropriate request submitted.


Martha A. Krebs
Director
Office of Energy Research

cc: John Marburger, BNL



DOEF 1325.B
(7-79)

DATE: February 26, 1998

U.S. DEPARTMENT OF ENERGY
memorandumREPLY TO
ATTN OF

Dean Helms, Executive Manager

SUBJECT:

**HAZARD CLASSIFICATION FOR THE RELATIVISTIC HEAVY ION
COLLIDER (RHIC) EXPERIMENTS**

TO:

David L. Hendrie, Director
Nuclear Physics Division
ER-23, GTN

Enclosed is a request from Brookhaven National Laboratory (BNL) for a Low Hazard Class Determination for the RHIC Experiments, with supporting documentation included. The supporting materials include Preliminary Safety Assessment Documents (PSADs) for the STAR and PHENIX detectors, along with satisfactory disposition of initial comments provided after review by the DOE Brookhaven Group (BHG). The request and supporting materials were provided directly to the DOE RHIC Independent Safety Review panel for consideration during this review, conducted February 18-20, 1998 at BNL. As you know, this review was chaired by the Nuclear Physics Division, with representation from ER, BHG, the Chicago Operations Office and other DOE Laboratories.

The results of this review generally supported a low hazard classification with respect to negligible off-site impact from the RHIC Experiments. A low hazard classification was also supported with respect to minor on site impacts from the experiments, with the exception of potential on-site impacts from the flammable gas hazard posed by the experiments, in particular the PHENIX detector. BNL is expected to conduct and provide additional analysis specific to this hazard to more fully support a conclusion of only minor on-site potential impact.

Please consider this submittal, along with the final results of the DOE RHIC Independent Safety Review, to allow an appropriate Program Secretarial Officer hazard class designation of the proposed RHIC experimental operations.

Enclosures:
As statedcc: J. Kennedy, OM, CH, w/o encls.
J. Yock, FERMI, w/o encls.



BROOKHAVEN NATIONAL LABORATORY
ASSOCIATED UNIVERSITIES, INC.

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RHIC Project

December 10, 1997

Mr. Robert Desmarais
U.S. Department of Energy
Building 464
P.O. Box 5000
Upton, New York 11973-5000

Dear Mr. Desmarais:

Attached is the disposition of DOE comments on the RHIC Experimental Program Hazard Classification request. If there are any questions or requests for additional information, please contact Steve Musolino.

Sincerely,

Satoshi Ozaki
Project Head

Attachments

cc: P. Carolan, DOE/BHG (w/o attachments)
T. Ludlam (w/o attachments)
Y. Makdisi (w/o attachments)
S. Musolino (w/o attachments)

Reply to DOE Comments on RHIC Experimental Program Hazard Classification

Comment

Provide more specific background regarding the two small detectors to support that the magnitude of hazards and risks is significantly below that for the large detectors, including an explanation of the hazard analysis and review process for the small detectors. Also, clarify the reference to the large detector "safety envelopes" (last sentence in Background). The STAR or PHENIX Preliminary Safety Assessment Documents (PSADs) do not specifically define safety envelopes. Clarify the reference to the large detector "safety envelopes" (last sentence in background). The STAR or PHENIX Preliminary Safety Assessment Documents (PSADs) do not specifically define safety envelopes.

Response

The two small detectors present substantially lower hazards, since the BRAHMS experiment uses comparatively small amounts of flammable gas, i.e., 1 m³ versus 50 m³ for PHENIX, while PHOBOS uses none. The spectrometer magnets are also comparatively small and the magnetic fields are confined. Below is an updated table which maps the intrinsic hazards to each detector system. The two small experiments shall be reviewed by the Experiment Safety Committee against the existing Committee Operating Procedure and criteria in it. The minutes of the Committee shall serve as the official safety documentation.

| <u>Subsystem</u> | <u>Hazards</u> | <u>Detector</u> |
|--------------------------------------|--|-----------------|
| Spectrometer Magnet | electrical, magnetic, waste water | S, P, B, PH |
| Time Projection Chamber | flammable gas, high voltage | S, B |
| Muon Tracking and Identifier | flammable gas, high voltage, confined space | P |
| Time Expansion Chamber | high voltage | S |
| Silicon Multiplicity Vertex Detector | none | S, P, B, PH |
| PAD Chambers | high voltage | S, P |
| EM Calorimeter | high voltage, rigging | S, P |
| Drift Chamber | flammable gas | P, B |
| Cerenkov Counter | flammable gas, high voltage | P |
| Pressurized Cerenkov Counter | flammable gas, high voltage | B |
| Time of Flight | high voltage | S, P, B, PH |
| Water cooling systems | high pressure, liquid effluents | S, P, B, PH |
| Experimental Halls | ODH from process helium | S, P, B, PH |

P - PHENIX B - BRAHMS
S - STAR PH - PHOBOS

The Safety Assessment Document for the RHIC Complex will integrate the Collider and Experimental analyses into one report. Based on the analysis results for the as-built detectors, any necessary Safety Envelopes will be defined. The Preliminary Safety Assessment Documents (PSADs) did not go so far as to define Safety Envelopes for the following reasons:

- a. The PSADs are scoping documents intended only to characterize the types and magnitudes of detector related hazards.
- b. Since it was assumed that the large detectors would require extensive safety documentation, the staff was required to begin the preparation of the detector safety documentation early in the development of the systems. Similar to the preparation of the Interim SAD for the Collider, the process resulted in the commitment of resources early in the Project to gain a head start in completion of the work. Unlike the Collider where the as-built final designs were well-known at the time the safety documentation was prepared, the detectors were only at a conceptual stage when the PSADs were completed.
- c. Safety Envelopes and other administrative operational tools will be derived from the analysis of the final as-built systems. They could not be defined based on conceptual designs.

Comment

Indicate the level of review and approval within BNL for the STAR and PHENIX PSADs, as well as for the experimental program hazard classification submitted.

Response

Because the PSADs were considered scoping documents and not intended to be used as a basis for operation, they were not subjected to the review and approval process for a typical SAD. The documents were treated as internal Project reports principally to facilitate completion of a major portion of the work towards the final reports on the as-built detectors systems. The reviewers of the reports were engineers and scientists within the STAR and PHENIX Groups, the Chairman of the Experiment Safety Committee and the Assistant to the Project Head for ES&H. The Hazard Classification request was reviewed by the Associate Head for Detectors, the Chairman of the Experiment Safety Committee and the Assistant to the Project Head for ES&H and approved by the Project Head.

Comment

Some of the references to supporting safety analysis documentation that was not included are unclear. The References section lists "Interim Safety Assessment Document, October 1997." The STAR PSAD section 4.1.5, and the PHENIX PSAD section 2.5.3 refer to section 3.9.2 of the "RHIC Safety Analysis Document." The only RHIC safety documentation submitted to DOE to date are the RHIC AtR Transfer Line SAD, August 1995, and an Interim RHIC SAD, October 1996. Please clarify these references. It might be helpful to include a summary of the referenced RHIC SAD section 3.9.2 in the Radiation Hazards section of the hazard classification.

Response

The date of October 1997 is a typographical error. The correct date, October 1996, corresponds to the existing SAD produced for the 1997 Sextant Test.

The references to Section 3.9.2 corresponded to a draft document that was superseded by the Interim Safety Assessment Document dated October 1996. Since the PSADs were terminal documents, the texts were not revised before distribution with the Hazard Classification request. Refer to aforementioned document Chapter 3, Section D, Design Criteria for Prompt Radiation for the intended information.

Comment

Two Appendices referenced in the hazard classification supporting documentation (PSAD) are not included. These are Appendix B (mentioned in STAR PSAD section 3.0) and Appendix C (mentioned in STAR PSAD section 4.1.5).

Response

STAR PSAD Appendix B and Appendix C are attached.

BROOKHAVEN NATIONAL LABORATORY

RHIC Project

MEMORANDUM

DATE: November 18, 1997
TO: Distribution
FROM: S. Musolino *SM*
SUBJECT: Hazard Classification

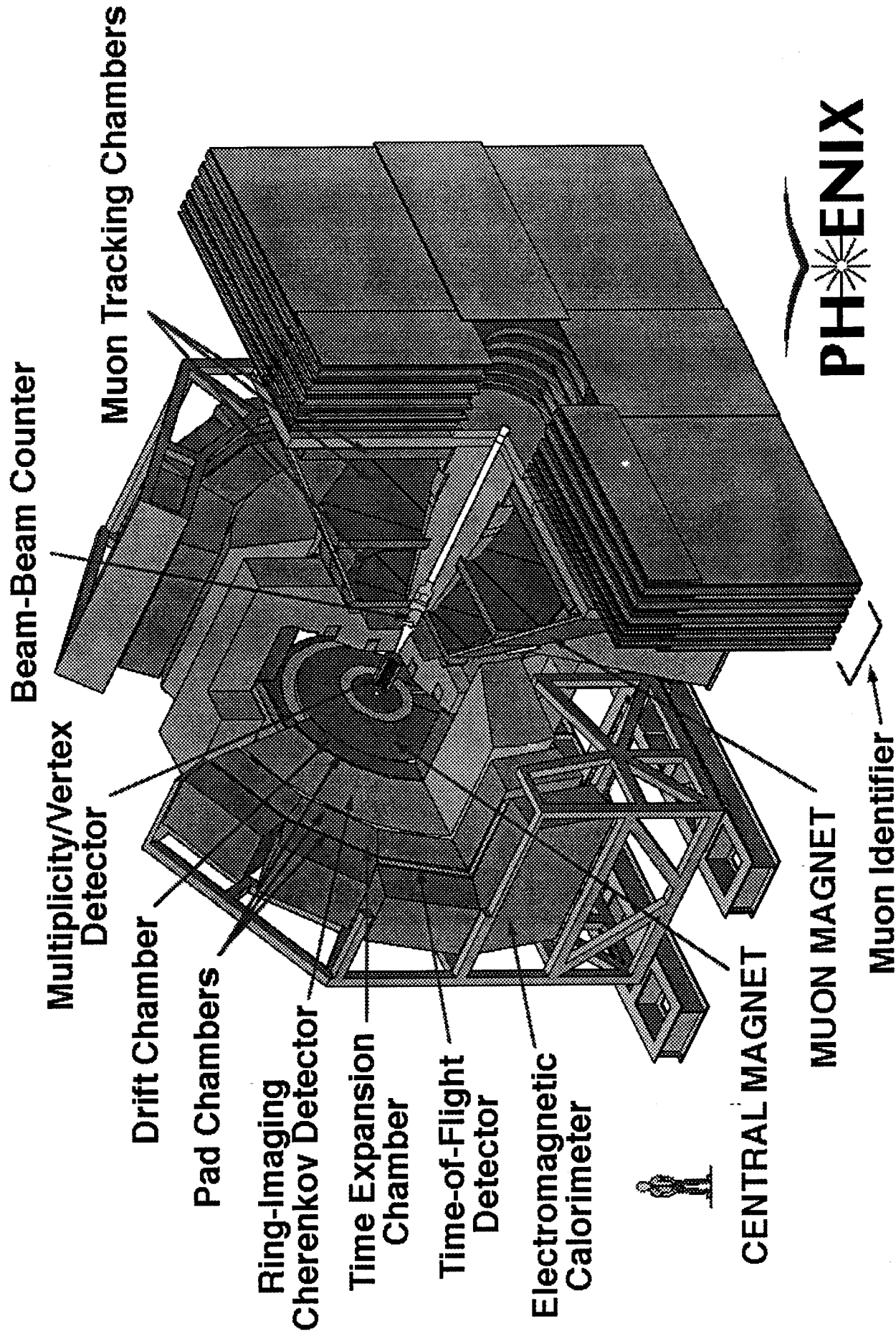
The attached Figures 1 and 2 were omitted from the original Hazard Classification document.

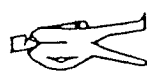
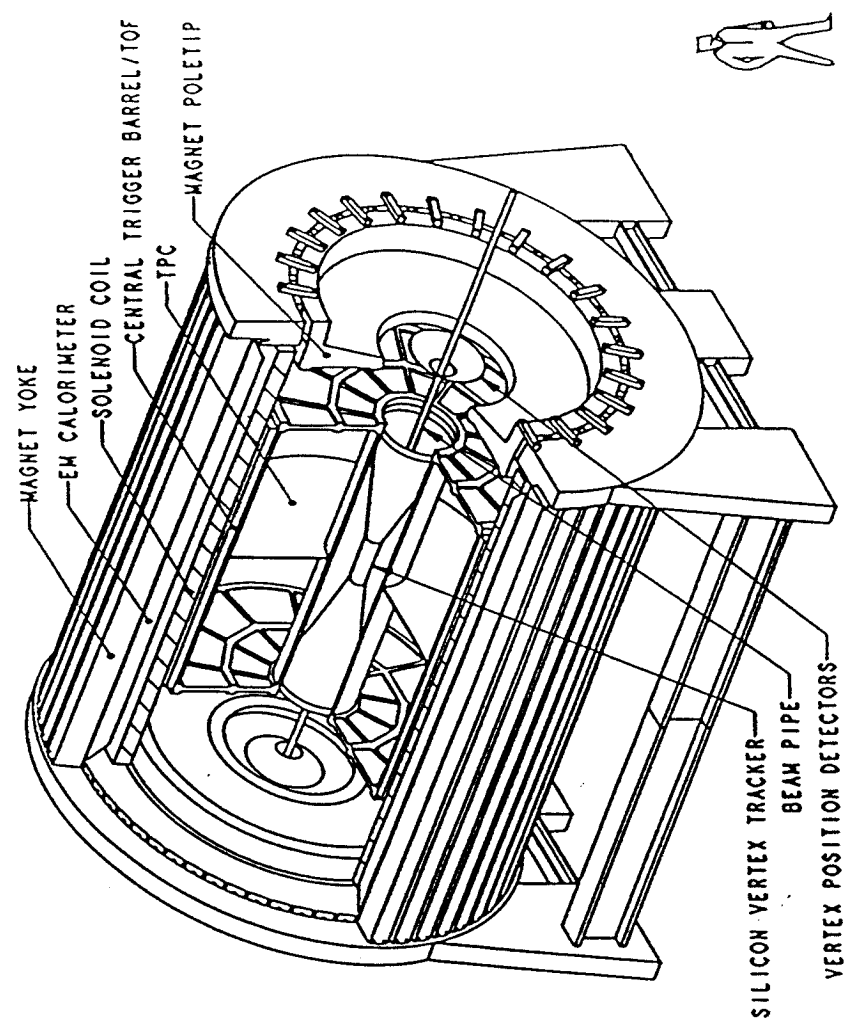
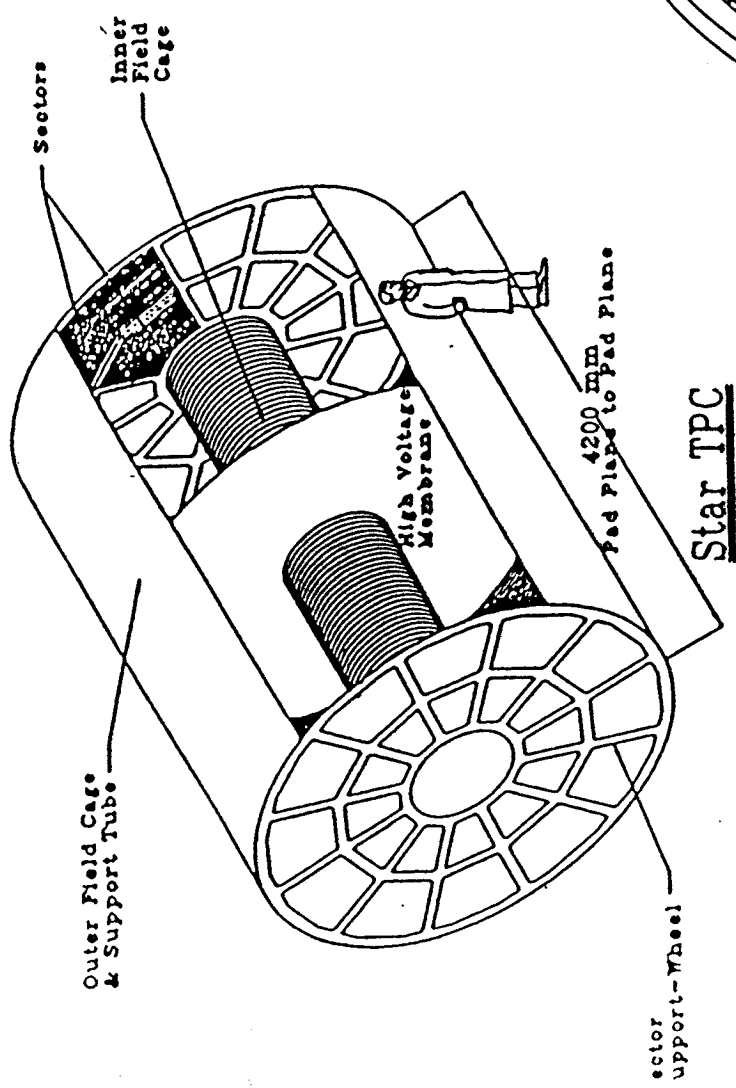
Attachments

Distribution:

W. Gunther
D. Helms (DOE)
T. Ludlam
Y. Makdisi
J. Marx
S. Ozaki
J. Yeck (DOE)

PHENIX Detector







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Office of the Director

November 10, 1997

Mr. Dean Helms
U.S. Department of Energy
Building 464
Brookhaven National Laboratory
Upton, New York 11973

Dear Mr. Helms,

Attached is a request for determination of the RHIC experimental program Hazard Classification. The Preliminary Safety Assessment Documents for the two large detectors, PHENIX and STAR, are included as supporting documentation. If there are any questions or requests for additional information, please contact Steve Musolino at 516-344-4211 or musolino@bnl.gov.

Sincerely,

A handwritten signature in black ink, appearing to read 'W. Gunther'.

William Gunther
Interim Associate Director

cc: T. Ludlam
Y. Makdisi
S. Musolino
S. Ozaki

BROOKHAVEN NATIONAL LABORATORY
RHIC Project
MEMORANDUM

DATE: November 10, 1997
TO: W. Gunther
FROM: S. Ozaki *S. Ozaki*
SUBJ: Request for Hazard Classification

Attached is the request to DOE for the Hazard Class Determination of the RHIC Experiments. Even though the proposed revision of DOE Order 5480.25 eliminates this requirement, there is no certainty the approved revision will in fact remove Hazard Classification nor is it known when the revision will be issued. Therefore, the Project will continue to comply with the current version of the Order.

Cc: T. Ludlam
S. Musolino

Hazard Classification for RHIC Experiments

Background

The Relativistic Heavy Ion Collider (RHIC) is configured to provide colliding beams at six locations to conduct experiments. A detailed description and safety analysis of the Collider was published in a Safety Assessment Document and approved by the Laboratory. The scope of the RHIC Project included funds for an experimental program that will develop four of the six regions with two large and two small detectors. In general the designs of them are similar to those found throughout the other DOE High Energy and Nuclear Physics laboratories. Each detector has been through an evaluation by independent engineering reviews as well as the Experiment Safety Committee to identify hazards and propose mitigation systems. Detailed designs of subsystems and overall integration are subjected to safety reviews as they become available. The final results of the completed safety analyses for the large detectors will be contained in the overall facility SAD. Since the magnitude of hazards and risks of the two small detectors is significantly below the large detectors and fall well within their safety envelopes, the safety analysis in the final SAD will be treated generically for small detectors.

Preliminary Safety Assessment Documents for Large Detectors

Safety documentation for the two large detectors was prepared to document the scope of hazards based on conceptual designs. The hazards identified in the PSADs for STAR and PHENIX demonstrated that they would fall into the Low Hazard Classification. The most significant risks are due to the use of large volumes of flammable gas in the PHENIX RICH detectors. These detectors represent a large amount of stored energy that could cause an explosion and fire. While the damage would be extensive to the detector, the effects would be confined to the vicinity of the experimental hall. Since the production of the PSADs the Experiment Safety Committee has been reviewing the actual detailed subsystem designs. The scope of the hazards from those reviews is shown below.

Large Detectors

The two large detectors, PHENIX and STAR are shown schematically in Figures one and two. Even though they are significantly different in physical design and measurement capability, both systems contain similar safety related hazards. In general:

1. A large volume of flammable gas inside a thin walled container,
2. A large conventional "warm" spectrometer magnet, several MW DC power,
3. Comparable implementation of safety systems,
4. Comparable level of accident consequences, principally fire and explosion,
5. No use of radioactive material as detector components, small sealed sources for calibration only,
6. Both detectors represent minor onsite and negligible offsite consequences with respect to BNL ES&H Standard 1.3.3, which was based on the canceled DOE 5481.1B

Specifically the large detectors possess the following subsystems with the associated hazards:

| <u>Subsystem</u> | <u>Hazards</u> | <u>Detector</u> |
|------------------------------|--|-----------------|
| Spectrometer Magnet | electrical, magnetic, waste water | S, P |
| Time Projection Chamber | flammable gas, high voltage | S |
| Muon Tracking and Identifier | flammable gas, high voltage, confined space | P |
| Time Expansion Chamber | high voltage | S |
| Multiplicity Vertex Detector | none | S, P |
| PAD Chambers | high voltage | S, P |
| EM Calorimeter | high voltage, rigging | S, P |
| Drift Chamber | flammable gas | P |
| Cerenkov Counter | flammable gas, high voltage | P |
| Time of Flight | high voltage | S, P |
| Water cooling systems | high pressure, liquid effluents | S, P |
| Experimental Halls | ODH from process helium | S, P |

P - PHENIX

S - STAR

Radiation Hazards

There are no radiation hazards that come directly from the experimental apparatus. There is no radioactive material used to fabricate detector components and there is no potential to disperse radioactivity due to an industrial type accident, fire, explosion due release of flammable gas, errant beam, etc., in an experimental region. Compared to fixed target machines, the total accelerated beam in a superconducting based collider is small due to long cycle periods. Consequently there is very little beam loss within the experiments and over the majority of the machine components. The only locations where large fractions of the beam are deposited is by design at the collimators and the beam dump. Therefore almost no activated material is produced in the experiments and very small amounts elsewhere in the Collider. The small amounts of activated material that is produced is in the form of bulk activation which is very stable and not in a dispersible form.

The only radiation hazard in the experimental halls is due to prompt radiation in the event of a low probability Design Basis Accident (DBA) fault of the beam at full energy. The ramifications of such a fault have been mitigated in accordance with the Design Criteria for Prompt Radiation. The criteria were described in the SAD and in part formed the basis for the Low Hazard Class designation of the Collider. The DBA scenario is applicable throughout the entire facility and the experiments pose no exceptions to it.

Conclusion

The hazards posed by the experimental program represent common industrial risks. The most significant result from the usage of large amounts of electrical power and flammable/explosive gases. These risks impact the worker within the facility and the public who may enter on educational tours, but are mitigated by a combination of active safety systems and administrative control. Therefore the probability of a major accident is low. Even if an incident should occur with a RHIC detector, it would be localized to the experimental hall and impact the mission of the facility, but the consequences would be minimal onsite and negligible offsite, if any, in terms of effects to the laboratory staff and the public. Therefore it is requested that a determination be made to designate the RHIC Experimental Program as Low Hazard.

References

Interim Safety Assessment Document, October 1997
Minutes of the Experiment Safety Committee, 1992 - 1997



Department of Energy

Brookhaven Area Office
Building 464
P.O. Box 5000
Upton, New York 11973

March 29, 1994

Dr. M.S. Davis
Associated Universities, Inc.
Brookhaven National Laboratory
Upton, New York 11973

Dear Dr. Davis:

**SUBJECT: HAZARD CLASSIFICATION FOR THE RELATIVISTIC HEAVY ION
COLLIDER (RHIC)**

Reference: Letter, Davis to Nealy, Dated, October 11, 1993

In response to your subject request, Dr. Martha Krebs, the Program Secretarial Officer for RHIC, designated RHIC as a Low Hazard facility. The approval letter and further guidance is attached.

If you have any questions concerning the approved guidance please contact Jim Yeck, the DOE RHIC Project Manager.

Sincerely,


Carson L. Nealy
Area Manager

Enclosure:
As stated

cc: S. Ozaki, BNL, w/encl.
S. Musolino, BNL, w/encl.

United States Government

Department of Energy

memorandum

DATE: MAR 18 1994

REPLY TO
ATTN OF: Energy Research

SUBJECT: Hazard Classification for the Relativistic Heavy Ion Collider

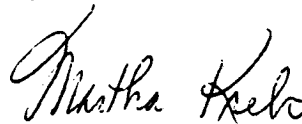
TO: Cherri Langenfeld, Manager, Chicago Operations Office

In response to your request, I have designated the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory (BNL) as a Low Hazard facility. As required by DOE Order 5480.25, SAFETY OF ACCELERATOR FACILITIES, the low hazard designation should serve as the design basis for the RHIC facility.

The hazard class determination is subject to the following conditions:

- o Either access controls or passive physical controls will be provided to assure that a credible potential accidental exposure above guidance values of persons with access to the transfer line area will be reduced, resulting in minor on-site and negligible off-site levels of hazard.
- o Sections of the RHIC Safety Assessment Document concerning prompt radiation hazards in the Alternate Gradient Synchrotron/RHIC transfer line will be reviewed by the Chicago Operations Office and the Office of Energy Research prior to beam extraction. These reviews will assure that the detailed safety analysis confirms the Low Hazard classification.

Experimental facilities are not included in the hazard class determination at this time. These facilities will be included once supporting safety analysis is completed and an appropriate request submitted.



Martha A. Krebs
Director
Office of Energy Research

cc:
N. Samios, Brookhaven National
Laboratory
J. Yeck, Brookhaven Area Office

United States Government

Department of Energy

Memorandum

DATE: MAR 14 1994

REPLY TO:
ATTN OF: Energy Research

SUBJECT: Low Hazard Classification for the Relativistic Heavy Ion Collider

TO: Martha Krebs, Director, Office of Energy Research

Your signature on attachment 1 is recommended.

Attachment 2 has been reviewed by the Brookhaven Area Office (BHO), the Chicago Operations Office (CH), the Nuclear Physics Division (NP), the Office of High Energy and Nuclear Physics (OHENP), and the Office of Assessment and Support (OAS). A Preliminary Safety Analysis Report on the Relativistic Heavy Ion Collider (RHIC) facility was prepared by the RHIC organization, and approved by the Brookhaven National Laboratory Directorate.

An on-site Independent Safety Review committee, chaired by NP, performed a review with participation by OHENP, OAS, BHO, and technical consultants from other accelerator laboratories. The summary report of that review cited two potential problems: the site-boundary is not clearly defined and a potential accident. These are addressed in the next two paragraphs.

At present, partial fencing in and around the Brookhaven National Laboratory allows the general public to enter the area surrounding the RHIC facility. The committee expressed concern about administrative requirements (training, posting, etc.) which would exist if this situation was not addressed. They did not express particular concerns that there were any serious safety issues created by this situation. Conclusion: The optimum access controls have not been determined, but there is no reason to believe they cannot be chosen to assure compliance with DOE personnel radiation exposure control guidelines; this will be done before operation commences.

The committee expressed a more significant concern with regard to the maximum credible radiation accident at RHIC. The alternating gradient synchrotron (AGS) will serve as an injector to the collider ring of the RHIC facility. Ions will be carried from the AGS to RHIC through a transfer line. The shielding planned for the RHIC facility is adequate to assure compliance with radiation exposure guidelines for the design beam intensities. RHIC will operate in a mode where the collider rings are filled with ions through the transfer line in a manner of minutes. This filling must be repeated on a 10-hour time cycle. At other times, the AGS ring can be used as a stand-alone high energy proton accelerator. If the much higher intensity proton beam possible in this stand-alone mode is steered by mistake into the transfer line and is lost at a point in that line, the calculated prompt radiation field at the top of the shielding berm over the transfer line is roughly 300 R/hour. Fortunately, any of several passive solutions are available to reduce this moderate hazard classification to a low hazard classification. Conclusion: There is no reason to believe that system design for the AGS to RHIC transfer line cannot be kept within the low hazard classification of RHIC.

The information submitted in support of a hazard class determination did not include the proposed experiments using two very large detectors, the STAR and PHOENIX detectors, which will ultimately be installed at two collision points in the RHIC ring. Since the Accelerator Safety Order, DOE 5480.25, allows a facility to be compartmentalized for hazard classification purposes, these detectors can be addressed at a later date. Conclusion: The hazard classification of the experimental facilities should be established separately at a later date, and the submission(s) should include consideration of potential impacts on the rest of the proposed low hazard RHIC facility.

In conclusion, the cited documentation supports a low hazard classification of the RHIC accelerator facility, subject to the conditions stated in Attachment 1.

WNH

Wilmot N. Hess
Associate Director for
High Energy and Nuclear Physics
Office of Energy Research

Attachments (2)

cc (w/o attachments):
N. Samios, Brookhaven National
Laboratory
J. Yeck, Brookhaven Area Office



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ASSOCIATED UNIVERSITIES, INC.

Upton, New York 11973

Office of the Director

TEL (516) 282- 3711
FAX (516) 282-

October 11, 1993

Dr. Carson L. Nealy, Manager
Brookhaven Area Office
U.S. Department of Energy
Upton, NY 11973

Dear Dr. Nealy:

Please request the Program Secretarial Officer for the Office of Energy Research to designate the Hazard Classification of the Relativistic Heavy Ion Collider and experiments as Low Hazard based on the attached material.

Sincerely,

M. S. Davis
Associate Director

kr

Attachment: Relativistic Heavy Ion Collider Request for
Designation of the Hazard Classification

cc: W. R. Casey
M. A. Harrison
S. A. Hoey
T. W. Ludlam
S. V. Musolino ✓
N. Narain
S. Ozaki
J. H. Yeck

Relativistic Heavy Ion Collider Request for Designation of the Hazard Classification

Background

The Relativistic Heavy Ion Collider (RHIC) is currently under construction. Subsequent to the start of construction DOE Order 5480.25, "Safety of Accelerator Facilities" was promulgated. A new requirement of the Order is to request the Program Secretarial Officer (PSO) to designate the Hazard Classification of the facility. Described below is the basis for such a request by the RHIC Project.

Safety Documentation

Compliance with DOE Orders and Guidance

Because the RHIC Project is a Major System Acquisition, a Preliminary Safety Analysis Report (PSAR), dated June 1991, was prepared to scope the hazard and risk potentials of the complex. It was produced in accordance with DOE Order 5481.1B, "Safety Analysis and Review System". The Order prescribes the contents of the Safety Analysis, the level of review and the level of authorization, given the magnitude of hazard of the facility. Attachment one is a list of the issues reported in the PSAR. The PSAR was accepted by the Laboratory Environment, Safety and Health Committee and approved by the Directorate. After receipt of Directorate approval the PSAR was provided to DOE for comment. The reviews by BHO and CH and were incorporated into the final revision.

The results of the PSAR and the subsequent analyses continue to indicate the operations of the Collider and Detectors will be consistent with a Low Hazard Facility and would result in minor onsite and negligible offsite consequences in the event of an accident. As shown in Attachment 1, each major subsystem of the Collider was assessed to make this determination. It is important to note that the PSAR assumed four times the "day one" beam intensity for the purpose of analysis.

With respect to Hazard Classification, DOE Order 5480.25 "Safety of Accelerator Facilities" requires formal designation by the Program Secretarial Officer (PSO). The contractor is required to submit the Hazard Classification request to DOE as early as feasible in the design and to comply with DOE 5481.1B by preparing a Safety Assessment Document (SAD).

Independent Safety Review

The PSO is required by DOE 5480.25 to form an independent review panel to review the safety provisions of the facility. On December 2-3, 1992, The Office of Energy Research conducted an Independent Safety Review (ISR) of the RHIC Project. The review Committee found, "the start of a comprehensive and appropriate effort in the area of Environment, Safety and Health". The Committee made four specific Recommendations and raised six considerations to factor into the final SAD. No Unresolved Safety Issues were identified by the Committee. The overall results of the review supported: the Hazard Classification determined by BNL; the existing safety documentation; and the analyses performed subsequent to the PSAR. Following the ISR, the Project provided an Action Plan to DOE to detail how and when each recommendation would be resolved.

The Committee observed that the Project only provided conceptual details on how a Design Basis Accident in the Transfer Line will be mitigated. In absence of the maturity of this aspect of the safety analysis and safety system design, the Project maintains that the final solution to mitigate a this accident will ensure that the facility stays within the boundaries of a Low Hazard Facility, where the probability of occurrence is Extremely Remote ($<10^{-4}/\text{yr}$). This issue was cited as a formal Action Item and will be addressed in the SAD.

Supporting Documentation

In order to comply with the National Environmental Policy Act, an Environmental Assessment (EA), DOE/EA #0508, December 1991, was prepared by the Project and approved by the Assistant Secretary for Environment, Safety and Health (EH-1). Attachment two is a list of the issues reported in the EA. Based on the EA, a Finding of No Significant Impact (FONSI) was issued by EH-1 on December 6, 1991.

The EA and FONSI provide analysis of the potential environmental impacts and the consequences from the alternatives in far greater detail than required for a PSAR or SAD. Therefore, these documents augment the requirements in DOE 5481.1B

Safety Documentation for Experiments

No safety documentation for experiments was provided in the PSAR because their conceptual designs were not defined until funding for the Project was obtained. The PSAR did commit to separate safety documents for experiments prior to operation.

Updated Letters of Intent for RHIC experiments were received by the Project in June of 1991. The two large detectors that were chosen by the Program Committee, STAR and PHENIX, have prepared Conceptual Design Reports. These reports have been approved and the designs were subsequently reviewed by the RHIC Experiment Safety Committee (ESC). The DOE Project Manager is provided copies of the ESC minutes, and the DOE Project Office staff have observed the Project experimental design

reviews. Both these experiments contain only components that fall inside the envelope for a Low Hazard classification, i.e. conventional spectrometer magnets, flammable and nonflammable gas systems, low voltage high current power supplies. Smaller experiments that are also at the conceptual design stage have indicated the intent to use components that are typical to high energy detectors which fall into a Low Hazard category.

The Project will be examining the specifics of the experimental apparatus as the details become known from the designers. Before routine operation of detectors, the safety analyses of STAR and PHENIX and their respective Safety Envelopes will be incorporated in the final SAD. The designs of the smaller RHIC experiments will be reviewed by the same process that the major detectors go through, but since the scope of hazards is much less than the large detectors, the SAD will discuss their class of experiment on a generic basis. This approach for both classes of experiments is consistent with the current practices of the DOE accelerator community reviews of large and small detectors.

Cryogenic Safety

The design basis for the various superconducting magnet cold masses have been reviewed and approved by the BNL Cryogenic Safety Committee and Directorate. These results were presented during the Independent Safety Review. The helium refrigerator has an existing Safety Analysis Report that was completed during the ISABELLE/CBA Projects. The document is an appendix in the PSAR. The design basis of the cryogenic system was reviewed by an expert panel invited by the Project, with DOE Project Office staff participating as observers. Safety was a component of the review. The committee concurred with the Project on the design and a formal report was issued in March 26, 1992.

Conclusion

Collectively, the PSAR, EA, FONSI, Conceptual Design Reports for STAR and PHENIX, and the respective internal and external safety reviews have assessed and documented the environment, safety and health aspects of the RHIC Project. It has been established that the Collider and experiments do not intend to contain any material that would cause them to be categorized as a Nonreactor Nuclear Facility under DOE Order 5480.23. Based on these reports the Project formally requests that the Director of the Office of Energy Research designate the Hazard Classification of the Collider and experiments of the RHIC Project as Low Hazard.

ATTACHMENT 1

RHIC PSAR Issues

Nonradiological

Life Safety
Training
Electrical
Fire
Asphyxiation
Cryogenic
Security
Magnetic
Air Pollutants
Toxic Materials
Mechanical
Vacuum
Noise
Radio Frequency

Radiological

Direct Personnel Exposure
Skyshine
Air Activation
Soil Activation
Muon Radiation
Activated Material

Safeguards

Fire
Electrical
Cryogenic
Radiation
Asphyxiation
Access

ATTACHMENT 2

RHIC EA Issues

Proposed Action

Other Alternatives

Site Description

Characterization of the Existing Environment

Potential Environmental Effects